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Comparative and superlative in English to Finnish machine translation

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Abstract

Finnish adjectives are productive in that they have comparative and superlative forms, and each of these forms inflects in all cases of the language. The logical way to implement comparative and superlative forms would be to list all three forms, i.e. basic, comparative and superlative, and give to each of them the inflection code concerned. If this method is used, lexicon entries tend to become excessively long, which has a negative effect on translation speed. There is also another method, where comparative and superlative forms are derived from the base form. This applies to adjectives and adverbs alike. The paper concerns this approach.

Key Words: *machine translation, comparative, superlative.*

1 Introduction

English language has two types of adjectives in regard to how their comparative and superlative forms are constructed. The basic adjectives inflect (e.g. *big, bigger, biggest*), but most derived adjectives use the pronoun *more* and *most* to show the grade (e.g. *more beautiful, most beautiful*). Finnish language does not have such dichotomy. All adjectives have one inflection paradigm, similar to the English basic inflection paradigm, although it is sometimes possible to use also the construction similar to the second English method.

In this paper I will show how it is possible to simplify the lexicon of adjectives and adverbs by listing only the base form of each word. The comparative and superlative forms will be derived from the base forms. There are, however, also such adjectives in Finnish, which cannot be treated in this way (e.g. *harras, hartaampi, hartain*). Those adjective forms can be listed in the lexicon as such. They are, however, a small minority of adjectives.

In the current translation system, the adjectives in the major category are those that have endings such as: *-nen, -nut, -nyt, -ton, -tyn, -tu, -ty, -va, and -vä*. These adjectives comprise about 85 percent of the total.

2 Procedure in producing comparative and superlative forms

We will demonstrate the procedure using the English word *likely* as an example. This word may occur as an adjective and an adverb. In (1) we have test sentences, where the word occurs as adjective and adverb, in base, comparative and superlative forms.

- (1)
The likely result is this.
The more likely result is this.
The most likely result is this.
Likely we will succeed.
More likely we will succeed.
Most likely we will succeed.

In the transfer lexicon of adjectives and adverbs, the lexical entries for *likely* in the Beta rule files are as in (2).

- (2)
likely; likely { todennäköinen NEN N38 FRONT } ;
likely; likely { todennäköisesti STI } ;

When we cut the translation chain on the point, where semantic disambiguation has been performed, we get the result as in (3).

- (3)
"<likely>"
 "likely" { todennäköinen NEN N38 FRONT } %A> DEF A ABS
"<result>"
 "result" { tulos N39 } %SUBJ DEF N NOM SG
"<is>"
 "be" { olla V67b BE V-4INF-TRA } %+FMAINV V PRES SG3
"<this>"
 "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
 "." { . }
"<<s>>"
 "<s>" { <s> }
"<more>"
 "much" { NOGLOSS } PL %AD-A> ADV CMP
"<likely>"
 "likely" { todennäköinen NEN N38 FRONT } %A> A ABS
"<result>"
 "result" { tulos N39 } %SUBJ DEF N NOM SG
"<is>"
 "be" { olla V67b BE V-4INF-TRA } %+FMAINV V PRES SG3
"<this>"
 "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
 "." { . }
"<<s>>"
 "<s>" { <s> }
"<most>"
 "much" { NOGLOSS } PL %AD-A> ADV SUP
"<likely>"
 "likely" { todennäköinen NEN N38 FRONT } %A> A ABS

```
"<result>"
  "result" { tulos N39 } %SUBJ DEF N NOM SG
"<is>"
  "be" { olla V67b BE V-4INF-TRA } %+FMAINV V PRES SG3
"<this>"
  "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*likely>"
  "likely" { todennäköisesti STI } %ADVL ADV
"<we>"
  "we" { me Np6 FRONT } HUM OUT %SUBJ PRON PERS NOM PL1
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*more>"
  "much" { NOGLOSS } PL %AD-A> CAPINIT ADV CMP
"<likely>"
  "likely" { todennäköisesti STI } %ADVL ADV
"<we>"
  "we" { me Np6 FRONT } HUM OUT %SUBJ PRON PERS NOM PL1
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*most>"
  "much" { NOGLOSS } PL %AD-A> CAPINIT ADV SUP
"<likely>"
  "likely" { todennäköisesti STI } %ADVL ADV
"<we>"
  "we" { me Np6 FRONT } HUM OUT %SUBJ PRON PERS NOM PL1
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF
"<.>"
  "." { . }
```

We see that the English words *more* and *most* have a semantic value NOGLOSS, because in Finnish no auxiliary words are needed in forming comparative and superlative forms.

The adjective *likely* has the tag NEN, and the adverb *likely* has the tag STI respectively. These tags are used for guiding further processing. In the next phase we add the tag indicating whether the word should be assigned a base, comparative or superlative interpretation (4).

```
(4)
"<likely>"
  "likely" { todennäköinen N38 FRONT } %A> NEN DEF A ABS SG
"<result>"
  "result" { tulos N39 } %SUBJ DEF N NOM SG SG
"<is>"
  "be" { olla V67b } %+FMAINV BE V-4INF-TRA V PRES SG3 SG
"<this>"
  "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<more>"
  "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
  "likely" { todennäköinen N38 FRONT } %A> NEN A ABS SG ADD-
CMP
"<result>"
  "result" { tulos N39 } %SUBJ DEF N NOM SG SG
"<is>"
  "be" { olla V67b } %+FMAINV BE V-4INF-TRA V PRES SG3 SG
"<this>"
  "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<most>"
  "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
  "likely" { todennäköinen N38 FRONT } %A> NEN A ABS SG ADD-
SUP
"<result>"
  "result" { tulos N39 } %SUBJ DEF N NOM SG SG
"<is>"
  "be" { olla V67b } %+FMAINV BE V-4INF-TRA V PRES SG3 SG
"<this>"
  "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*likely>"
  "likely" { todennäköisesti } %ADVL STI ADV
"<we>"
```

```
"we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1
"<will>"
"will" { NOGLOSS } %+FAUXV V AUXMOD PL1
"<succeed>"
"succeed" { menestyä V52 FRONT } %-FMAINV V INF PL1
"<.>"
"." { . }
"<<s>>"
"<s>" { <s> }
"<*more>"
"much" { NOGLOSS } %AD-A> PL CAPINIT ADV CMP
"<likely>"
"likely" { todennäköisesti } %ADVL STI ADV ADD-CMP
"<we>"
"we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1
"<will>"
"will" { NOGLOSS } %+FAUXV V AUXMOD PL1
"<succeed>"
"succeed" { menestyä V52 FRONT } %-FMAINV V INF PL1
"<.>"
"." { . }
"<<s>>"
"<s>" { <s> }
"<*most>"
"much" { NOGLOSS } %AD-A> PL CAPINIT ADV SUP
"<likely>"
"likely" { todennäköisesti } %ADVL STI ADV ADD-SUP
"<we>"
"we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1
"<will>"
"will" { NOGLOSS } %+FAUXV V AUXMOD PL1
"<succeed>"
"succeed" { menestyä V52 FRONT } %-FMAINV V INF PL1
"<.>"
"." { . }
```

The base form is default and needs no tag. For comparative interpretation is added the tag ADD-CMP, and for superlative interpretation the tag ADD-SUP. This applies to adjectives and adverbs alike.

Then the conversion tag is converted to surface form using Beta rules (5).

```
(5)
"<likely>"
"likely" { todennäköinen N38 FRONT } %A> NEN DEF A ABS SG
"<result>"
"result" { tulos N39 } %SUBJ DEF N NOM SG SG
"<is>"
"be" { olla V67b } %-FMAINV BE V-4INF-TRA V PRES SG3 SG
"<this>"
"this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
```

```

"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<more>"
  "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
  "likely" { todennäköinen N38 FRONT } %A> +sempi N16-H A ABS
SG ADD-CMP
"<result>"
  "result" { tulos N39 } %SUBJ DEF N NOM SG SG
"<is>"
  "be" { olla V67b } %+FMAINV BE V-4INF-TRA V PRES SG3 SG
"<this>"
  "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<most>"
  "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
  "likely" { todennäköinen N38 FRONT } %A> +sin N51 A ABS SG
ADD-SUP
"<result>"
  "result" { tulos N39 } %SUBJ DEF N NOM SG SG
"<is>"
  "be" { olla V67b } %+FMAINV BE V-4INF-TRA V PRES SG3 SG
"<this>"
  "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*likely>"
  "likely" { todennäköisesti } %ADVL STI ADV
"<we>"
  "we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*more>"
  "much" { NOGLOSS } %AD-A> PL CAPINIT ADV CMP
"<likely>"
  "likely" { todennäköisesti } %ADVL +mmin ADV ADD-CMP
"<we>"

```

```

    "we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1
"<will>"
    "will" { NOGLOSS } %+FAUXV V AUXMOD PL1
"<succeed>"
    "succeed" { menestyä V52 FRONT } %-FMAINV V INF PL1
"<.>"
    "." { . }
"<<s>>"
    "<s>" { <s> }
"<*most>"
    "much" { NOGLOSS } %AD-A> PL CAPINIT ADV SUP
"<likely>"
    "likely" { todennäköisesti } %ADVL +immin ADV ADD-SUP
"<we>"
    "we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1
"<will>"
    "will" { NOGLOSS } %+FAUXV V AUXMOD PL1
"<succeed>"
    "succeed" { menestyä V52 FRONT } %-FMAINV V INF PL1
"<.>"
    "." { . }

```

The new suffix for comparative and superlative forms has a prefix +, indicating that it should be joined to the word stem, and the original suffix removed. This is implemented in (6).

```

(6)
"<likely>"
    "likely" { todennäköinen N38 FRONT } %A> NEN DEF A ABS SG
"<result>"
    "result" { tulos N39 } %SUBJ DEF N NOM SG SG
"<is>"
    "be" { olla V67b } %+FMAINV BE V-4INF-TRA V PRES SG3 SG
"<this>"
    "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
    "." { . }
"<<s>>"
    "<s>" { <s> }
"<more>"
    "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
    "likely" { todennäköisempi N16-H FRONT } %A> A ABS SG ADD-
CMP
"<result>"
    "result" { tulos N39 } %SUBJ DEF N NOM SG SG
"<is>"
    "be" { olla V67b } %+FMAINV BE V-4INF-TRA V PRES SG3 SG
"<this>"
    "this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"

```


"." { . }
"<<s>>"
"<s>" { <s> }
"<most>"
"much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
"likely" { todennäköisin N51 FRONT } %A> A ABS SG ADD-SUP
"<result>"
"result" { tulos N39 } %SUBJ DEF N NOM SG SG
"<is>"
"be" { olla V67b } %FMAINV BE V-4INF-TRA V PRES SG3 SG
"<this>"
"this" { tämä Np1 FRONT } %PCOMPL-S PRON DEM SG
"<.>"
"." { . }
"<<s>>"
"<s>" { <s> }
"<*likely>"
"likely" { todennäköisesti } %ADVL STI ADV
"<we>"
"we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1
"<will>"
"will" { NOGLOSS } %FAUXV V AUXMOD PL1
"<succeed>"
"succeed" { menestyä V52 FRONT } %FMAINV V INF PL1
"<.>"
"." { . }
"<<s>>"
"<s>" { <s> }
"<*more>"
"much" { NOGLOSS } %AD-A> PL CAPINIT ADV CMP
"<likely>"
"likely" { todennäköisemmin } %ADVL ADV ADD-CMP
"<we>"
"we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1
"<will>"
"will" { NOGLOSS } %FAUXV V AUXMOD PL1
"<succeed>"
"succeed" { menestyä V52 FRONT } %FMAINV V INF PL1
"<.>"
"." { . }
"<<s>>"
"<s>" { <s> }
"<*most>"
"much" { NOGLOSS } %AD-A> PL CAPINIT ADV SUP
"<likely>"
"likely" { todennäköisimmin } %ADVL ADV ADD-SUP
"<we>"
"we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1
"<will>"
"will" { NOGLOSS } %FAUXV V AUXMOD PL1

```
"<succeed>"  
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF PL1  
"<.>"  
  "." { . }
```

The final translation is in (7).

(7)
Todennäköinen tulos on tämä.
Todennäköisempi tulos on tämä.
Todennäköisin tulos on tämä.
Todennäköisesti me menestymme.
Todennäköisemmin me menestymme.
Todennäköisimmin me menestymme.

We see that it is possible to handle comparative and superlative forms of adjectives and adverbs as a single process. For adverbs there is no further processing, because they do not inflect. With adjectives the case is different, because they inflect in all possible cases.

3 Procedure in inflecting comparative and superlative forms

We see in the examples above that adjectives have an inflection code to guide the formation of the surface forms. Although in base form the adjectives may have tens of different inflection codes, in comparative and superlative they have a unique code for comparative and superlative. For comparative it is *N16-H*, and in superlative it is *N51*. In comparative, the code has an extension *-H* indicating that it may undergo gradation processes *mp > mm* and *mm > mp*, according to the case in question. In superlative such variation does not occur.

In (8) we have examples for testing how adjectives in comparative and superlative inflect in various cases. For adverbs this does not apply.

(8)
In the likely case we will come.
In the more likely case we will come.
In the most likely case we will come.
In the likely way it will succeed.
In the more likely way it will succeed.
In the most likely way it will succeed.

Here again, we process the translation system to the point, where we add inflection tags to words (9).

```
(9)  
"<*in>"  
  "in" { M-LOC1 } %ADVL CAPINIT PREP  
"<likely>"  
  "likely" { todennäköinen N38 FRONT } %A> NEN DEF A ABS SG
```

```
"<case>"
  "case" { tapaus N39 } %<P DEF N NOM SG SG @INE
"<we>"
  "we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1 @NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 @PRES
"<come>"
  "come" { tulla V67 } %-FMAINV O-LOC3 MOVE V INF PL1 @PRES
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<more>"
  "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
  "likely" { todennäköisempi N16-H FRONT } %A> A ABS SG ADD-
CMP
"<case>"
  "case" { tapaus N39 } %<P DEF N NOM SG SG @INE
"<we>"
  "we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1 @NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 @PRES
"<come>"
  "come" { tulla V67 } %-FMAINV O-LOC3 MOVE V INF PL1 @PRES
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<most>"
  "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
  "likely" { todennäköisin N51 FRONT } %A> A ABS SG ADD-SUP
"<case>"
  "case" { tapaus N39 } %<P DEF N NOM SG SG @INE
"<we>"
  "we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS NOM PL1 @NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 @PRES
"<come>"
  "come" { tulla V67 } %-FMAINV O-LOC3 MOVE V INF PL1 @PRES
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
```

```

"<likely>"
  "likely" { todennäköinen N38 FRONT } %A> NEN DEF A ABS SG
"<way>"
  "way" { tapa N9-E } %<P OUT DEF N NOM SG SG @ADE
"<it>"
  "it" { se Np11 FRONT } %F-SUBJ OUT PRON NOM SG3 @NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD SG @PRES
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF SG @PRES
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
"<more>"
  "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
  "likely" { todennäköisempi N16-H FRONT } %A> A ABS SG ADD-
CMP
"<way>"
  "way" { tapa N9-E } %<P OUT DEF N NOM SG SG @ADE
"<it>"
  "it" { se Np11 FRONT } %F-SUBJ OUT PRON NOM SG3 @NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD SG @PRES
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF SG @PRES
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<most>"
  "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
  "likely" { todennäköisin N51 FRONT } %A> A ABS SG ADD-SUP
"<way>"
  "way" { tapa N9-E } %<P OUT DEF N NOM SG SG @ADE
"<it>"
  "it" { se Np11 FRONT } %F-SUBJ OUT PRON NOM SG3 @NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD SG @PRES
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF SG @PRES
"<.>"
  "." { . }

```

We see that conversion tags for comparative and superlative, ADD-CMP and ADD-SUP have been added. In addition, inflection tags for basic words, such as nouns and verbs, have been added. Note that the inflection codes for adjectives, which modify a noun, are still missing. This will be done in the next phase (10).

```
(10)
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<likely>"
  "likely" { todennäköinen N38 FRONT } %A> NEN DEF A ABS SG
@INE
"<case>"
  "case" { tapaus N39 } %<P DEF N SG INE
"<we>"
  "we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS PL1 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 PRES
"<come>"
  "come" { tulla V67 } %-FMAINV O-LOC3 MOVE V INF PL1 PRES
@PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<more>"
  "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
  "likely" { todennäköisempi N16-H FRONT } %A> A ABS SG ADD-
CMP @INE
"<case>"
  "case" { tapaus N39 } %<P DEF N SG INE
"<we>"
  "we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS PL1 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 PRES
"<come>"
  "come" { tulla V67 } %-FMAINV O-LOC3 MOVE V INF PL1 PRES
@PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<most>"
  "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
  "likely" { todennäköisin N51 FRONT } %A> A ABS SG ADD-SUP
@INE
```

```

"<case>"
  "case" { tapaus N39 } %<P DEF N SG INE
"<we>"
  "we" { me Np6 FRONT } %SUBJ HUM OUT PRON PERS PL1 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 PRES
"<come>"
  "come" { tulla V67 } %-FMAINV O-LOC3 MOVE V INF PL1 PRES
@PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
"<likely>"
  "likely" { todennäköinen N38 FRONT } %A> NEN DEF A ABS SG
@ADE
"<way>"
  "way" { tapa N9-E } %<P OUT DEF N SG ADE
"<it>"
  "it" { se Np11 FRONT } %F-SUBJ OUT PRON SG3 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD SG PRES
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF SG PRES
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
"<more>"
  "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
  "likely" { todennäköisempi N16-H FRONT } %A> A ABS SG ADD-
CMP @ADE
"<way>"
  "way" { tapa N9-E } %<P OUT DEF N SG ADE
"<it>"
  "it" { se Np11 FRONT } %F-SUBJ OUT PRON SG3 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD SG PRES
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF SG PRES
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP

```

```
"<most>"
  "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
  "likely" { todennäköisin N51 FRONT } %A> A ABS SG ADD-SUP
@ADE
"<way>"
  "way" { tapa N9-E } %<P OUT DEF N SG ADE
"<it>"
  "it" { se Np11 FRONT } %F-SUBJ OUT PRON SG3 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD SG PRES
"<succeed>"
  "succeed" { menestyä V52 FRONT } %-FMAINV V INF SG PRES
"<.>"
  "." { . }
```

English uses the preposition *in* in all examples to mark location. In Finnish, however, there is a difference between inner locative and outer locative. In the context, which the sentences represent, location diverts to two directions. If the noun head is *case*, Finnish uses inner locative. If the noun head is *way*, Finnish uses outer locative. Note that this dichotomy applies only to the given types of sentences.

Now we proceed to demonstrate how the inflected forms of comparatives and superlatives are formed (11).

```
(11)
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<likely>"
  "likely" { todennäköi:nen+nessa :N38 FRONT } %A> NEN DEF A
ABS SG INE
"<case>"
  "case" { tapau:s+knessa :N39 } %<P DEF N SG INE
"<we>"
  "we" { m:e :Np6 FRONT } %SUBJ HUM OUT PRON PERS PL1 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 PRES
"<come>"
  "come" { tul:la+emme :V67 } %-FMAINV O-LOC3 MOVE V PRES
PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<more>"
  "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
  "likely" { todennäköisemp:i+assa :N16-H FRONT } %A> A ABS SG
ADD-CMP INE
```

```

"<case>"
  "case" { tapau:s+ksessa :N39 } %<P DEF N SG INE
"<we>"
  "we" { m:e :Np6 FRONT } %SUBJ HUM OUT PRON PERS PL1 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 PRES
"<come>"
  "come" { tul:la+emme :V67 } %-FMAINV O-LOC3 MOVE V PRES
PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<most>"
  "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
  "likely" { todennäköisi:n+mmaassa :N51 FRONT } %A> A ABS SG
ADD-SUP INE
"<case>"
  "case" { tapau:s+ksessa :N39 } %<P DEF N SG INE
"<we>"
  "we" { m:e :Np6 FRONT } %SUBJ HUM OUT PRON PERS PL1 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 PRES
"<come>"
  "come" { tul:la+emme :V67 } %-FMAINV O-LOC3 MOVE V PRES
PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
"<likely>"
  "likely" { todennäköi:nen+sella :N38 FRONT } %A> NEN DEF A
ABS SG ADE
"<way>"
  "way" { tap:a+alla :N9-E } %<P OUT DEF N SG ADE
"<it>"
  "it" { s:e :Np11 FRONT } %F-SUBJ OUT PRON SG3 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD SG PRES
"<succeed>"
  "succeed" { menesty:ä+y :V52 FRONT } %-FMAINV V SG PRES
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"

```



```

    "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
"<more>"
    "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
    "likely" { todennäköisemp:i+alla :N16-H FRONT } %A> A ABS SG
ADD-CMP ADE
"<way>"
    "way" { tap:a+alla :N9-E } %<P OUT DEF N SG ADE
"<it>"
    "it" { s:e :Np11 FRONT } %F-SUBJ OUT PRON SG3 NOM
"<will>"
    "will" { NOGLOSS } %+FAUXV V AUXMOD SG PRES
"<succeed>"
    "succeed" { menesty:ä+y :V52 FRONT } %-FMAINV V SG PRES
"<.>"
    "." { . }
"<<s>>"
    "<s>" { <s> }
"<*in>"
    "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
"<most>"
    "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
    "likely" { todennäköisi:n+mmalla :N51 FRONT } %A> A ABS SG
ADD-SUP ADE
"<way>"
    "way" { tap:a+alla :N9-E } %<P OUT DEF N SG ADE
"<it>"
    "it" { s:e :Np11 FRONT } %F-SUBJ OUT PRON SG3 NOM
"<will>"
    "will" { NOGLOSS } %+FAUXV V AUXMOD SG PRES
"<succeed>"
    "succeed" { menesty:ä+y :V52 FRONT } %-FMAINV V SG PRES
"<.>"
    "." { . }

```

The inflection code is converted into surface form and added to the word itself. Note that the ending of the word is still there. This is for facilitating the formation of the correct form for the front vowel words. In the current translation system, back vowel inflection is considered as default. The code FRONT prompts the conversion of the ending into front inflection form. In (12) we have a version, where inflected words are processed further towards the surface form and the front inflection is implemented.

```

(12)
"<*in>"
    "in" { M-LOC1 } %ADVL CAPINIT PREP
"<likely>"
    "likely" { todennäköi+sessä } %A> NEN DEF A ABS SG INE
"<case>"
    "case" { tapau+ksessa } %<P DEF N SG INE

```

```
"<we>"
  "we" { m:e } %SUBJ HUM OUT PRON PERS PL1 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 PRES
"<come>"
  "come" { tul+emme } %-FMAINV O-LOC3 MOVE V PRES PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<more>"
  "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
  "likely" { todennäköisemm+ässä } %A> A ABS SG ADD-CMP INE
"<case>"
  "case" { tapau+ksessa } %<P DEF N SG INE
"<we>"
  "we" { m:e } %SUBJ HUM OUT PRON PERS PL1 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 PRES
"<come>"
  "come" { tul+emme } %-FMAINV O-LOC3 MOVE V PRES PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { M-LOC1 } %ADVL CAPINIT PREP
"<most>"
  "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
  "likely" { todennäköisi+mmässä } %A> A ABS SG ADD-SUP INE
"<case>"
  "case" { tapau+ksessa } %<P DEF N SG INE
"<we>"
  "we" { m:e } %SUBJ HUM OUT PRON PERS PL1 NOM
"<will>"
  "will" { NOGLOSS } %+FAUXV V AUXMOD PL1 PRES
"<come>"
  "come" { tul+emme } %-FMAINV O-LOC3 MOVE V PRES PL1
"<.>"
  "." { . }
"<<s>>"
  "<s>" { <s> }
"<*in>"
  "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
"<likely>"
  "likely" { todennäköi+sellä } %A> NEN DEF A ABS SG ADE
"<way>"
```

```

    "way" { tav%+alla } %<P OUT DEF N SG ADE
"<it>"
    "it" { s:e } %F-SUBJ OUT PRON SG3 NOM
"<will>"
    "will" { NOGLOSS } %+FAUXV V AUXMOD SG PRES
"<succeed>"
    "succeed" { menesty+y } %-FMAINV V SG PRES
"<.>"
    "." { . }
"<<s>>"
    "<s>" { <s> }
"<*in>"
    "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
"<more>"
    "much" { NOGLOSS } %AD-A> PL ADV CMP
"<likely>"
    "likely" { todennäköisemm+ällä } %A> A ABS SG ADD-CMP ADE
"<way>"
    "way" { tav%+alla } %<P OUT DEF N SG ADE
"<it>"
    "it" { s:e } %F-SUBJ OUT PRON SG3 NOM
"<will>"
    "will" { NOGLOSS } %+FAUXV V AUXMOD SG PRES
"<succeed>"
    "succeed" { menesty+y } %-FMAINV V SG PRES
"<.>"
    "." { . }
"<<s>>"
    "<s>" { <s> }
"<*in>"
    "in" { NOGLOSS M-ADE } %ADVL CAPINIT PREP
"<most>"
    "much" { NOGLOSS } %AD-A> PL ADV SUP
"<likely>"
    "likely" { todennäköisi+mmällä } %A> A ABS SG ADD-SUP ADE
"<way>"
    "way" { tav%+alla } %<P OUT DEF N SG ADE
"<it>"
    "it" { s:e } %F-SUBJ OUT PRON SG3 NOM
"<will>"
    "will" { NOGLOSS } %+FAUXV V AUXMOD SG PRES
"<succeed>"
    "succeed" { menesty+y } %-FMAINV V SG PRES
"<.>"
    "." { . }

```

The final translation is in (13).

(13)

Todennäköisessä tapauksessa me tulemme.

Todennäköisemmässä tapauksessa me tulemme.

Todennäköisimmässä tapauksessa me tulemme.
Todennäköisellä tavalla se menestyy.
Todennäköisemmällä tavalla se menestyy.
Todennäköisimmällä tavalla se menestyy.

4 Conclusion

We have demonstrated that it is possible to handle most of the comparative and superlative forms of adjectives and adverbs with a method, where only base forms with codes are included into the conversion lexicon. Comparative and superlative forms are derived from these codes. Also, inflection codes for adjectives are added with the same method. In the later phase of the translation process, also inflected forms of comparative and superlative forms are produced. With this method, about 85 percent of adjectives can be handled. Also, practically all those adverbs, which have comparative and superlative forms, can be handled with this method.

Although the method described here is not necessary in machine translation, it greatly simplifies transfer lexicons, and it also speeds up translation process, which is always at stake.